The Assessment of the Ultimate Hull Girder Strength Subjected to Grounding Damages

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ABSTRACT

The objective of the present study is to assess the ultimate hull girder strength of grounding damaged under longitudinal bending. A single hull bulk carrier and double hull oil tanker are taken to be analyzed. The Finite Element Method is used to assess the ultimate hull girder strength including their behavior both single hull bulk carrier and double hull oil tanker. The grounding damage is simply cretaed by removing the element component from the bottom part. Two cases of grounding damage are observed, those are center part and the asymmetric position. For the simple calculation, one-frame space is considered for the longitudinal damage extent in longitudinal direction, and the cross-section of single hull bulk carrier and double hull oil tanker are taken. The transversal damage extent is taken to be equal with the percentage of ship breadth and the vertical damage extent is equal or less than the height of double bottom structure. The cross-section of those ships are assumed to be remained plane and the vertical bending moment is applied. The welding residual stress, initial imperfection and crack exstension are not taken into account in the analyses. To assess the ultimate hull girder strength including the progressive collapse behavior of ship hull with and without grounding damage for single hull bulk carrier and double hull oil tanker, the simply supported of boundary condition is imposed to the cross section taking the hogging and sagging condition into account. For the comparison and validation purpose, the analytical solution is carried out, and the Smith's method is adopted. The result obtained by Finite Element Method of single hull bulk carrier and double hull oil tanker for intact and damage condition in hogging and sagging condition is compared with the analytical solution obtained by Smith's method to observe the collapse behavior in advanced.

Keywords: Ship hull, cross section, ultimate strength, Finite Element Method, grounding damage